Protection of the Environment in Transitional Economies:

Strategies and Practices

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ABSTRACT

Attention is brought to the high pollution intensities of Centrally Planned Economies in comparison to market economies. This is explained by the use of Kuznets-type environmental development curves. These curves for CPEs tend to be higher than for market economies, and in Europe per capita incomes in market economies are mostly higher than for European CPEs and this is an additional factor. It is argued that it may take some time for former CPEs to attain the Kuznets curve for market economies once they begin transition. Transitional difficulties include possibly an inadequate appreciation of market failures, fuzzy property rights, reduced central control over local governments, in some cases breakdowns of law and order and capital stock and infrastructure which can only be substantially modified in the long run so as to improve pollution intensities and natural resource-use. In the longer term, the market system will provide incentives that at least indirectly improve pollution intensities and natural resource intensities. Nevertheless, of the system stimulate economic growth pollution intensities can rise initially. Environmental problems and transitionary processes for former European Centrally Planned resources are discussed, as are China's environmental problems, China's Agenda 21 as a long-term strategy for sustainable development, and its environmental policies in practice. In conclusion, China's approach to its environment in its transition is contrasted to that of the former European Centrally Planned economies.

1. INTRODUCTION

Transition from planned to market-based economies has now been in process in former Soviet-style economies for several years, and in some cases for at least two decades, as in China. Even in those economies which have moved relatively rapidly to adopt market systems, transition takes time. "Big-bang" instantaneous transitions to market economies remain mythical because the past continues to influence the present for some time. Even in the case of East Germany (which cannot be regarded as typical because of its speedy integration as a region into the already well established market economy of the Federal Republic of Germany with considerable

aid from West Germany), replacement of equipment and infrastructure is gradual. This means that reduction in the unfavourable environmental side-effects of the industrial capital stock is not immediate.

There is little doubt that former Soviet-style planned economies suffered high pollution and environmental degradation intensities in relation to their levels of production. There are several reasons for this, but social and economic ones appear to be very important. This essay will explore the reasons involved, examine difficulties for environmental regulation of economies in transition and then specifically discuss the Eastern European and Russian situation and that of China. An analytical and descriptive approach is taken.

2. POLLUTION INTENSITIES AND ENVIRONMENTAL DEGRADATION IN SOVIET-STYLE CENTRALLY PLANNED ECONOMIES

Zylicz (1994, p. 89) points out that it is "well documented that Centrally Planned Economies (CPEs) used to exert a significantly greater pressure on their environmental resources than comparable market economies". For instance, the pollution intensities of the former group are significantly higher. Comparing six Central and Eastern European countries (Bulgaria, Czechoslovakia, GDR, Hungary, Poland and Rumania) with the European Community at the end of the 1980s, he found that solid wastes in tonnes per $1,000 of GDP were 1.0 in the former and 0.4 in the latter, waste water in cubic metres is 83 in the former and 24 in the latter per $1,000 of GDP, gases 51 kg and 24 kg respectively and dust 13 kg and 1 kg respectively for every $1,000 of GDP produced (Zylicz, 1994, p. 89). Partly the difference could be due to differences in GDP per capita between the economies but Zylicz suggests that even for economies with comparable

incomes per capita, pollution intensities were higher in the centrally planned economies, and also their intensity of energy and water use was higher.

The matter can be clarified by use of a Kuznet-type of environmental development curve. It is widely believed that as economic growth occurs and income per head in a country rises, pollution intensities and environmental degradation at first rises and at high enough income levels declines. The relationship involved might therefore be of the type shown in Figure 1, by the curve ABCDE. There may be several reasons for the inverted-U shape of this curve. For example, at lower levels of income, industries that are energy intensive may dominate an economy (in the early growth stages secondary industry becomes relatively important) whereas less energy intensive industries and ones transforming fewer natural resources, such as service industries, become more important at higher income levels. Stages of relative sectoral development in an economy (Clark, 1957) affect the nature of this curve.

In addition, as the size of the economy increases, greater scope may exist for utilising wastes (by-products) for productive purposes and technologies because of economies of scale may be more often be of a type which utilises resources more fully in the production process thereby generating fewer wastes. In addition, as income rises there is likely to be greater demand for cleaner and more agreeable natural environments.

Insert Figure 1

Given the type of relationship shown by the curve ABCDE, one would expect centrally planned economies to have higher pollution intensities than market economies if per capita incomes in the latter are considerably higher than in the former, for example at y_2 compared to y_1 in the former case.

However, as Zylicz indicates, centrally planned economies may typically experience higher intensities of pollution and environmental degradation for the same level of GDP per capita as market economies. Thus, while in Figure 1, curve ABCDE may be the Kuznet-pollution curve for market economies, that for centrally planned economies (CPEs) might be more like that indicated by the broken curve FGHL. The reasons for the difference include the following:

(i) Poor allocation methods add to resource use per unit of output in CPEs. This results in more resources being 'wasted' or if pollution is a positive function of resource-use, other things equal, there is generation of greater pollution per unit of output.

(ii) Managerial inefficiency in CPEs and failure to adopt technologies or develop technologies which economise on resource use further adds to the problem.

(iii) Social factors also play a role. Stalinism emphasised material production as a source of wealth, ignoring the importance of the service industries including the significance of environmental services.

(iv) State-owned enterprises were often in a position to use political power to avoid compliance with environmental regulations or block their introduction.

(v) Restriction of international trade in CPEs, for the most part its restriction to communist countries, often resulted in the availability only of highly polluting fuels and resources, for example the use of coal high in particulate matter and sulphur.

Let us now consider what might happen if a centrally planned economy (CPE) is at a point such as G in Figure 1, and then begins transition to a market economy. It will not move instantaneously from point G to B. Its environmental transition path is unclear. For instance, pollution intensities might initially increase before converging towards those for market economies. However, if transition does occur, pollution intensities in the longer term, in the

transformed economy, must be lower than was so for a CPE which starts at point G, as in the case shown in Figure 1. This is because point G is above all points on curve ACE. However, in the case shown in Figure 2, pollution intensities may actually increase in the CPE once it transforms to a market economy. It may, for example, start initially from point G with per capita income of y_1. Market reforms may raise per capita income in the economy to y' $_1$ and it may transit to point B' on the market Kuznet curve. It will experience both increased income and a high intensity of pollution. However, in the very long term, once its income has increased sufficiently for it to be beyond Point C in Figure 2, say at D, decreased pollution intensities are experienced. The environmental prognosis for a former CPE depends on where the country is located in relation to Kuznet-type curves shown in Figure 2. In the case of a country like China for example successful transition might for a time be accompanied by rising pollution intensities, but intensities much lower than would have been experienced under a CPE system for the same level of income or growth.

Insert Figure 2

3. ENVIRONMENTAL PROBLEMS IN THE TRANSITIONAL PHASE

It is possible for CPE's to experience considerable environmental difficulties in their transitional phase to a market economy. These may be such that environmental problems initially increase rather than lessen. At the very least, new environmental problems and issues emerge. Let us

consider some of these difficulties.

In the early stages of transition, euphoria may exist about the potential of market systems. This can result in market advocates being blind to the possibility of market failures such as the presence of unfavourable environmental externalities. Again, politicians (and some economists) may take the view that the main priority should be to establish the market system and not to worry too much in the early stages about its imperfections. Once the system is established imperfections can be corrected in due course. Basically, such corrections are looked at as fine tuning, and are matters of subsidiary concern.

During the process of transition to a market economy, property rights may become fuzzy or uncertain. This can result in those who control the use of such resources and who can benefit from their exploitation, accelerating their rate of exploitation. Moreover, relaxation of state control over resources can result in these becoming *de facto* open-access property. For example, reduced control by the central Russian government over the management of protected areas because of its shortages of finance has resulted in their illegal exploitation at the local level.

In some transitional economies, the power of central government over local governments has diminished. Apart from the problem mentioned above, this can result in local authorities permitting polluting activities which adversely affect neighbouring regions and thereby reduce overall national production or welfare. This may, for example, have occurred in parts of China and Russia.

Again there is a risk of breakdown of law and order in transitionary economies as has occurred to some extent in the former Soviet Union, because of the speed of the social change involved. In addition, law reforms and the introduction of new laws do not always keep pace with the economic transformation of the economies involved. As pointed out by Coase (1960),

legal uncertainty can be a significant source of unfavourable externalities.

At the same time as transition raises new environmental issues, it creates new opportunities for controlling pollution. It provides scope for establishing new sets of property rights and for ensuring that the management of production units obtain economic rewards which increase with the profitability of their unit. Such rewards provide incentives to economise on natural resource use and to adopt cost-saving innovations which indirectly result in greater output per unit of input and therefore are likely to reduce the pollution intensity of production. Scope also emerges for using economic instruments to control pollution which have little or no role in a centrally planned system, especially in one which emphasises targets for quantities of output as prime goals. Taxes or charges on pollution emissions become a policy option as do tradeable or marketable pollution permits. Furthermore, managers are likely to take greater care with new investment to ensure that equipment installed is profitable and economically efficient. Indirectly this is likely to result in a fall in the intensity of pollution and environmental degradation. Improvements in the operation of capital and finance markets will reinforce this effort.

Even if market failures exist under a market system, it is to be expected that the market system will reduce the intensity of pollution (in comparison to a CPE for the same GDP), once it has been in operation for some time. It cannot, however, be concluded that the absolute level of pollution or environmental degradation will be lower under a market system. If for example, introduction of the system results in greater economic growth, the absolute level of pollution and environmental degradation may rise, and even the intensity of pollution may go up as illustrated in Figure 2.

That the absolute level of pollution in an economy may rise at the same time as the intensity-level of its pollution falls, may not always be appreciated. However, it is a consequence of the

Kuznet-like curve assumed to relate pollution intensities to the per capita level of income. This curve, such as the one shown by ABCDE in Figure 1, can be interpreted as an average curve to which there corresponds a marginal curve of pollution. Figure 3 indicates the type of relationship which exists between the average or intensity curve ABCDE and its corresponding marginal curve MNRS. Total pollution is indicated by the summation of the area under the latter curve and is found mathematically by integration. We observe that if per capita income should rise from y_1 to y_2, that the pollution intensity falls, but the total level of pollution in the country rises. *Only* when income levels move into the range beyond y_3 (and marginal pollution is negative) does the total level of pollution begin to fall.

Insert Figure 3

Applying the above to a CPE which transits to a market economy, it may achieve greater income growth as a result. Both because of a more efficient economy and economic growth, its pollution intensity may eventually fall. Nevertheless, its *total* contribution to pollution and environmental degradation can be expected to rise for some time if its income levels go up. Where the pollutants involved are of global consequence, such as greenhouse gases, this can be expected to exacerbate global environmental problems. Thus, the conversion of CPEs to successful market economies (and bearing in mind that market economies are likely to be engines of economic growth given the stage of development of many CPEs) is likely to add to global environmental concerns, as for example has the economic growth of China.

Note that the Kuznet-type curves used in this discussion should be cautiously interpreted even though they are useful for the purpose of exposition. Considerable controversy for example is

possible about how best to construct an environmental pollution and degradation *index* because a wide range of environmental variables are involved, and these may assume different degrees of relative importance to different people. These difficulties, however, should not prevent us from thinking about these issues, particularly since local activities often have global environmental consequences.

4. OBSERVATIONS ON ENVIRONMENTAL PROBLEMS AND PRACTICES IN EASTERN EUROPE AND RUSSIA, BEFORE AND IN TRANSITION

There is no doubt that the former CPEs neglected the environmental impacts of material production to the serious detriment of nature, human health and the quality of life. Environmental disasters and disaster areas were all too frequent such as the one around Norva and Kohtla-Järve in Estonia where oil shale mining, power stations and chemical industries give rise to serious air and water pollution and cause serious human health problems as outlined by Kallaste (1994, pp 134-135).

The reason for such an appalling environmental situation was not purely the relatively low level of economic development of the CPEs and their low levels of per capita income, which would have placed them towards the bottom of the Kuznet-like pollution/environmental degradation curve, but the nature of the economic system itself. Russian-dominated CPEs had a number of factors which meant that environmental considerations were neglected in planning economic activity.

Stalinism gave priority to the development of heavy industries (steel and metal industries,

chemical and power), all of which were major sources of pollutants and held back the growth of light industry. Furthermore, the service industries, which tend to have the lowest pollution intensities, were retarded on the traditional Marxist basis that they are unproductive. The distorted sectoral composition was thus one factor making for a high pollution intensity in relation to production levels.

The system was unable to take full advantage of the laws of comparative advantage and the scope for beneficial trade and exchange. This resulted in high input-output ratios and greater use of locally available polluting material than was feasible. High input-output ratios were a source of higher pollution intensities and of accelerated natural resources depletion. High levels of investment and use of resources were used to compensate for allocative inefficiency, and the presence of obsolete or backward technologies.

Marxist views appear to have influenced policies on charging for the use of natural resources. There was a tendency not to charge for their use, or to underprice their use. This meant that they were not appropriately valued and were indiscriminately used as inputs in production and as sinks for pollution from industry. User-pays and pollution-pays principles were not a part of CPE culture.

So called economic branches dominated groups concerned with regional affairs and management. Broad production plans tended to emanate from the centre, mostly from Moscow, and showed no or little sensitivity to local environmental problems. Virtually no local communal input was possible. The distance between the centre and the localities or regions became as source of social and environmental insensitivity. Often the environmental problems of one region spilt over to another, or the combination of the environmental impacts of several regions magnified their total regional impact. Such issues were largely ignored or only begun to be

considered seriously towards the end of the CPE system.

Not only did the system have allocative and social shortcomings, but it was not a strong source of invention, innovation and technological progress generally. While not all new technology is necessarily environmentally friendlier than that of older vintage, it often is. It is often for example input saving or cost saving or a product innovation may replace a product that is more material intensive than the new product. If use of the environment and natural resources are appropriately priced, and factored into economic rewards such as profits, this encourages the development and adoption of environmentally friendlier technology. These incentives were absent in the CPEs. As Kallaste (1994, p. 153) points out "for many years there was no significant incentives for investments in environmentally benign technologies or waste production equipment".

A further factor contributing to the continuation of serious environmental problems in the CPEs was the lack of freedom of the communication media and the absence of multiparty democratic government. Thus, grassroots and regional political action to rectify these problems was stifled. State-owned industrial firms were in a position to generate horrific environmental impacts with relative impunity. The environmental problems generated were to a considerable extent due to the *whole* Stalinist-type system, not just purely economic aspects.

Nevertheless, there was some attention to environmental problems under communism in the Soviet Union. In the 1970s Gosplan allowed for greater investment in the protection of water resources, mainly to deal with health problems, and various official committees were set up to consider environmental protection and make recommendations. Considerable administrative and legal changes occurred for protection of the environment throughout the 1980s and into the 1990s. But as Ählander (1994, p. 79) observed, "laws and resolutions do not automatically

achieve anything. While production plans generally are accompanied by the allocation of resources required to fulfil them, regulations are not. If necessary, inputs and technical equipment are not provided, even enterprises actually motivated to comply might not be able to do so".

Nevertheless, in the early stages of transition in the Soviet Union, useful philosophies and tools for environmental management were identified as a part of *perestroika* which were to become the cornerstone for environmental protection in the period 1991-2005, for Russia at least. These tools, however, were also adopted by some other members of the former Soviet bloc, e.g. Poland and Estonia.

As elaborated on by Ählander (1994), these are:

(i) The use of (social) cost-benefit analysis for environmental decision making.

(ii) The introduction of pollution charges and payments for using natural resources, such as water.

(iii) The introduction of self financing systems for environmental protection measures taken at the regional or national level.

On the surface, the framework appears to be an almost ideal one for addressing the type of environmental issues besetting the former CPEs. However, cost-benefit analysis is mainly restricted to 'objective' evaluation and used more widely at lower levels than at higher levels for environmental policy determination. According to Ählander (1994), "payments for utilization of natural resources such as land, water, forests and minerals, were introduced in 1991" (p. 74), and "pollution charges were established for all principal pollutants emitted; air, water and solid wastes" (p. 75).

It seems, however, that the mode of payment of fees (prices) for natural resources and

pollution emissions were such as to provide no incentive for firms to economise on natural resource-use or on their emissions of pollutants. This is because the fees were not paid out of the 30 per cent of a firms' profit left for its discretionary use, but from the 70 per cent of profit payable to the State. Thus the opportunity cost to an enterprise of paying these charges was *zero*. It had no incentive to *economise* on its use of scarce natural and environmental resources, and this reduced the effectiveness of the scheme.

On the other hand, the scheme did result in funds becoming available for regional and national protection. Income from environmental and natural resources charges were paid into funds to finance regional and national environmental protection authorities and providers of some natural resources. Thus greater funds were available for treating wastes, for the purification of water, and for supplying some natural resources. In addition, enterprises could be allowed to retain some of the pollution fee income for their investment in pollution reductions. The scheme on the whole turned out to be more reactive than preventative; one of treating the symptoms rather than addressing causes. In fact, Ählander (1994) argues that the "so-called 'economic incentives' that were introduced are not likely to be effective until the whole economy is built on the basis of economic incentives". While this may be an exaggeration, it is easy to see why the environmental policy measures were much less effective than they might appear to be on the surface.

It seems that Poland (Zylicz, 1994) and Estonia (Kallaste, 1994) moved in a similar direction to Russia as far as environmental policy is concerned. In this regard, Zylicz (1994, p. 97) observes that pollution fees and natural resource charges in Poland are substantial. Nevertheless they are far from optimal and they will need to be adjusted as enterprises move from soft budget to hard budget conditions, as seems inevitable if market reforms are to run their full course.

Once market reforms have been fully completed, environmental and pollution charges will have to be deducted from the profit of enterprises. They will reduce pollution emissions and natural resource-use if they are positive at the margin of these activities. However, in the short-term there may be little scope for variation. The main impact is likely to be in the longer term as new investment is undertaken.

As reforms proceed and prices are adjusted, some enterprises may find it difficult or impossible to make a profit. To impose significant charges on these firms for use of the environment may cause them to become bankrupt, even though they may be in a position to cope with these charges in the longer run. In order not to add significantly to unemployment in the short-term, easing in of these charges may be required (cf. Steenge, 1991).

Opinion is divided about the best policy instruments to use to control pollution and environmental resource-use in former European CPEs. There are differences of opinion about whether to use fees, quotas or standards or have a system of tradeable or marketable permits based on quotas or standards (Sterner, 1994; Zylicz, 1994) to control pollution emissions and natural resource-use. Even the polluter-pays principle has been questioned (van der Staaten and Hufkomp, 1992). Practices in existing market-economies provide little guidance because none have settled exclusively on one method or another, although the United States appears to have made greater use of marketable pollution permits than most other countries. Furthermore, there are also other policies that can be used as part of a set of environmental policy measures, eg. zoning of industries according to the environmental externalities which they create; changes in the law, so that the law defines rights more carefully and gives scope for negotiation or legal remedies.

It is not possible to debate the pros and cons that these alternative policy instruments here but

it may be that it is optimal to use an array of these instruments. It is unlikely that one single instrument will be best in all circumstances, and in some cases a combination may be required, e.g. fees or taxes on emissions and zoning.

5. CHINA: AN INTRODUCTION TO ITS TRANSITION AND ITS ENVIRONMENT

Commencing around 1978, China began its process of *gradually* transforming itself into a market economy. Gradualism and cautious experimentation are the keystones of China's process of transition, and it has adopted the process of reforming the economic system first and delaying change in its political system.

Many of the environmental problems which China experienced were similar to those of European CPEs and had similar roots. Under Mao, however, there seemed to be an even greater obsession with the idea of self-sufficiency at the regional level, and even down to smaller units. By reducing the possibilities for beneficial exchange, this added to resource-use in relation to the volume of output. Mao's personal rejection of the laws of comparative advantage was to no avail, as indicated by the dismal failure of "The Great Leap Forward". The whole system resulted in a high level of pollution intensity and environmental degradation in relation to GDP.

Apart from the self-sufficiency doctrine, distorted prices for commodities created problems. Some prices for natural resources encouraged their wasteful use. Little control existed on use of the environment for waste disposal.

China has progressively moved in the reform period to improve its regulation of natural resource- use and to control environmental pollution. This was necessary because of previous neglect, the environmental impacts and demands for rapid economic growth and its perceived

shortage of natural resources. Let us consider the last two matters, then outline China's Agenda 21 which is intended as a long-term framework for its sustainable development, and then examine China's environmental regulation in practice.

China has a serious shortage of water. The World Bank (1992) considers that countries with less than 2,000 cubic metres of water per capita have serious problems especially in drought periods and those with less than 1,000 cubic metres per capita face chronic water problems. Given predicted population changes, freshwater resources per capita in China are predicted to fall to less than 1,500 cubic metres by 2025 (World Bank, 1992). China's water availability problem will undoubtedly worsen. Furthermore increasing industrial production and higher income levels will add to the demand for water. The geographical distribution of water resources in China combined with seasonal variation in water availability is already causing severe problems in China especially in parts of its northeast, for example in the Beijing-Tianjin area. It might also be noted that given the high value placed on China's limited freshwater resources, pollution of these can be expected to impose a heavy economic cost on China.

Unfortunately many of China's water resources have become polluted. Some lakes are reported to contain unacceptable levels of heavy metals released from industry, e.g. those in the Wuhan area. The organic levels and sediments carried in most rivers have increased significantly. Furthermore high rates of artificial fertilizers used in agriculture and inadequate treatment of sewage has significantly added to the nitrate and phosphorous levels in rivers. It has been suggested that the discharge of these nutrient-rich waters into the China Sea is a prime factor making for the periodic occurrence of red tides which kill fish *en masse* and/or make them poisonous for human

consumption. It ought to be noted that all these types of water pollution threaten China's aquaculture industry which in terms of volume of production, is by far the largest in the world and a significant source of animal protein for China's population. Of course, the economic costs of water pollution are much wider than this example indicates and its health consequences and its impact in reducing biodiversity should not be ignored.

Air quality in China has deteriorated seriously with its economic growth. Excluding township enterprises (considered by some to be a source of serious pollution), sulphur dioxide remissions in China increased by more than one-third in the period 1982-1992 and other gases contaminating the air more than doubled (estimates from figures supplied by Wu and Flynn, 1995, p. 4). Most of China's large cities have air quality much lower than the standards set by the World Health Organization. For example, the air in Shenyang is heavily polluted and this has been proposed as a source of the high incidence of cancer amongst its population. Air pollution is responsible for a high incidence of respiratory illness in many of China's cities.

In fact because air quality is so poor, 26 per cent of all deaths in China are attributed to it, five times the U.S. level of such deaths (Bingham, 1993, p. 12). Respiratory disease is the biggest single source of death in China. Acid rains are a serious problem and sometimes cause pH levels in rivers south of the Yangtze to fall below 5.6 even though alkaline loess dust helps to reduce this acidity. Inefficient boilers and small power stations are a major source of this pollution (Bingham, 1993).

China is relatively rich in coal resources, and the burning of coal in China is a serious source of local air pollution. Furthermore, the burning of fossil fuels in China is adding significantly to greenhouse gases and China's emissions of such gases is predicted to

rise significantly. In 1989, China ranked third in the world in terms of greenhouse gas emissions; after the U.S. and the Soviet Union. "However by 2020, China would be the world's largest producer of carbon dioxide, releasing three times as much as the US." (Bingham, 1993, p. 12).

Solid wastes create serious problems. About 55,000 ha of land is covered with untreated solid waste, most of it industrial and much of it contains heavy metals and toxic substances. Leaching from such waste dumps threatens aquifers and groundwater (Bingham, 1993, p. 14).

Loss of forests in China has occurred on a significant scale. Estimates of the World Resources Institute et al., (1994, Table 17.1) indicate that the area of forest and woodland in China decreased by 6.5% between 1979 and 1991. Consequently, in 1992 only 13.6% of China's area was covered in forest and woodland. This is one of the lowest percentages for Asian countries and is slightly less than the estimated percentage forest cover for Bangladesh (cf. Tisdell,1995).

While forest loss is not the only source of biodiversity loss, it can be a significant source. Like several countries in Asia, China has a large number of threatened species of mammals, birds and higher order plants. These are reported by the World Resources Institute et al. (1994, Table 20.4) to be 40, 83 and 3,340 respectively, and many of these species are unique to China.

Taking the situation overall, Chinese authorities estimate that almost 7% of China's GDP is lost due to environmental pollution, about twice the estimated percentage in high income countries (Bingham, 1993, p. 10). Chinese estimates put the annual economic costs of pollution (to China) at about 90 billion yuan, 40 billion of which is attributed to

water pollution, 30 billion to air pollution and around 25 billion to pollution from solid wastes and pesticides. However, actual economic costs may be much higher than this when for example, full account is taken of the adverse impact of pollution on human health.

6. CHINA'S AGENDA 21: A STRATEGY FOR THE LONG-TERM

China is aiming to become a middle income country in the next century. It is clear that its increasing income and levels of production will bring greater environmental problems. It is even possible that China's quest could be thwarted if it does not adopt appropriate development and environmental strategies. It requires strategies which will facilitate sustainable economic development. In order to address this issue, China has drawn up Agenda 21.

In 1994, the Executive of the State Council of China adopted *China's Agenda 21 - White Paper on China's Population, Environment and Development in the 21st Century*. This is a wide-ranging document which, in English, consists of some 20 Chapters and is 244 pages in length. It is China's response to the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 which called on all nations to develop and put into effect their own strategies for sustainable development.

The preamble to this document states that "traditional ideas of considering economic growth solely in quantitative terms and the traditional development mode of "polluting first and treating later" are no longer appropriate when considering present and future requirements for development. It is now necessary to find a path for development,

wherein consideration of population, economy, society, natural resources, and the environment are coordinated as a whole, so that a path for non-threatening development can be found which will meet current needs without compromising the ability of future generations to meet their needs" (State Council, 1994, p. 1). The document goes on to elaborate on this theme.

The white paper points out that China's economic growth is hampered by its large population, relatively inadequate natural resources and fragile environment as well as its low capabilities in science and technology. It suggests that this requires holistic co-ordination of China's economic growth. At the same time as China adopts growth measures to become a middle-income country in the 21st century, China's Agenda 21 states that "it will be necessary [for it] to conserve natural resources and to improve the environment, so the country will see long-term, stable development." Consequently, the development principles outlined above are articulated in China's Agenda 21.

Continuing market reforms and opening to the outside world are seen as an important part of China's Agenda 21 presumably because these can result in more efficient use of natural resources. Maintenance of population control is regarded as essential and measures to introduce technologies that are more environmental friendly than current ones are seen as desirable. Institution building and improvements in China's legal system are desired targets, as is continuing international cooperation. All of these factors are expected to contribute to China's sustainable development. The main policies recommended for China's sustainable development have been summarised as follows:

"• Carry forward reform and expand opening to the outside, and accelerate the

establishment of the socialist market economy system, with the economic development as the central focus;

- Enhance capacity building for sustainable development, particularly standardize the establishment of the systems of policies, laws and regulations, and indicators of the strategic objectives. It is also important to set up a management system of resources, biological monitoring system, statistical system of social and economic development, and related system of information services, and to improve the public awareness of sustainable development and the implementation of China's Agenda 21;
- Control population growth, enhance population quality, and improve population make-up;
- Popularize sustainable agricultural technology that suit local conditions;
- Develop clean coal technology, and other forms of clean and renewable energy sources;
- Adjust industrial structure and distribution, improve the rational utilization of resources, and reduce pressures on transportation and communication due to industrial development;
- Popularize cleaner production techniques, minimize the output of waste, encourage the conservation of resources and energy, and enhance the utilization efficiency;
- Speed up the construction of "better-off building", and improve residential environment;
- Develop and popularize key technology for environmental pollution control;

- Strengthen the protection of water resources and sewage treatment, protect and expand vegetation cover, rationally utilize biological resources to safeguard biodiversity, improve regional environmental quality, increase land productivity and mitigate natural disasters."

(Administrative Centre for China's Agenda 21, 1994, pp. 6-7)

The white paper (State Council, 1994) itself, however, gives little attention to possible conflicts between objectives and how these might be best resolved. Hence, it is doubtful if it provides a workable blueprint for development. To some extent this is understandable. However, it should be observed that if a holistic approval to economic development is adopted then trade-offs between objectives will be unavoidable. To a considerable extent, the various chapters of the white paper dealing with different sectors and spheres of development read as independent entities. There is therefore some concern that much of the white paper consists of 'motherhood' statements and window-dressing. Furthermore, some may wonder if the English version of the white paper presented to promote China as an environmental leader of less developed countries and to allay the concerns of some Westerners about the environmental consequences of China's economic growth.

On the other hand, the positive side should not be forgotten. At least China's policy leaders do recognize that an economic growth dilemma may exist which calls for positive measures to conserve China's environmental resources even in its present economic growth stage. Recognition, while not sufficient, is necessary if concrete policy actions are to be taken to address the matter. Secondly, China appears to be one of the few countries to have followed up the UNCED resolution on Agenda 21 in a concrete

manner. It is possible that China's Agenda 21 will become a catalyst for more workable policies for sustainable development in the future, and that China could become a leader in that regard.

In the past China was well known for its use of integrated diversified productive systems at the village level. These systems produced virtually no waste. Even today some of its integrated agriculture-aquaculture systems may be of this nature. Such systems basically incorporate balance, stability and harmony. In reality, however, China has increasingly abandoned such naturally balanced systems and has moved towards monocultures increasingly dependent on high energy inputs typical of Western productive systems. China has been moving towards productive systems dependant on high levels of external inputs typical of those in western countries. I have for example seen non-integrated aquaculture systems in China which involve the raising of a single species, e.g. white eels, using imported fish meal. Furthermore, it must be a matter for environmental concern that China's consumption of artificial fertilizer is now the largest in the world (Wu and Flynn, 1995, p. 4). Its application of manufactured fertilizer per hectare is now more than twice that in high income countries (Wu and Flynn, 1995, p. 4). Thus it seems that China has or is adopting production methods copied from the West which may be inappropriate to its environmental situation.

Economists who advocate market-making as the solution to society's ills will be pleased to learn that special mention is made in China's Agenda 21 of the desirability of making effective use of economic instruments and market mechanisms for promoting sustainable development. The Administration Centre for China's Agenda 21 (1994, p. 16) summarises the main points in this regard as:

"• Reform the unreasonable pricing system, and establish the paid use system for all kinds of resources and energy;

• Employ the taxation, financial and credit policies in promoting sustainable development;

• Endorse studies on economic policies to maintain sustainable development."

Despite this statement, reading of China's Agenda 21 white paper as a whole indicates a high degree of reliance on administrative measures rather than price-related strategies for environmental control.

7. CHINA'S ENVIRONMENTAL POLICIES IN PRACTICE

As mentioned earlier, principles and practice often diverge, sometimes sharply. China is continuing to lose natural resources and in several respects its environmental deterioration continues as its economic growth proceeds. The types of dilemmas that China faces are seen by its decision to proceed with the Three Gorges Dam. The dam will undoubtedly change the environment in the Yangtze Valley considerably even though it will bring economic advantages, at least in the short to medium term. However, it is hard to believe that the natural resource stock of this region will not be reduced and so one could say that China in making this decision is not acting in accordance with strong sustainability conditions said to be desirable in the preamble to its Agenda 21.

Possibly the first major moves by China to protect its environment in recent times began with the Second National Environmental Protection Work Conference in 1983. In

1984, following this conference, the Environmental Protection Commission was established under the State Council "to co-ordinate all ministries and agencies whose activities affect the environment. Similar organizations and institutions were set up at the local level" (Wu and Flynn, 1995, p. 5). Thus a relatively comprehensive administrative system for environmental management was established in China.

In the 1980s policy makers appear to have reached widespread agreement on:

(1) use of the *precautionary principle*, that is avoiding environmental problems by means of prior planning and when necessary incorporating defensive environmental elements into projects.

(2) The importance of imposing greater responsibility and liability on polluters by using the *`polluter pays' principle* to internalize pollution costs which would otherwise be external to organizations.

(3) *Strengthening government administration* of environmental controls. Qu and Li (1994) claim that in fact strengthening of administrative management of the environment has been the main focus of the new policy.

China has considerably increased the number of persons employed in environmental protection. In 1981 only 22,000 were employed in this way but in 1992 the number was 74,898. Comparatively, however, it is still a low number and the number has failed to increase proportionately with China's GDP because the growth in this employment has been linear rather than logarithmic (see Wu and Flynn, 1995, Table 2, p. 5). Nevertheless, in 1991 China is estimated to have spent 1 percent of its GNP on environmental improvement compared to 0.7 percent of GNP in the 7th Five Year Plan (1985-1990). The National Environmental Protection Agency's target is to increase this

to 1.5 percent (Bingham, 1993, p. 10) which for a less developed country is a substantial investment in environmental protection.

Coming to China's practice in using economic instruments to control pollution, there can be little doubt that China has made great progress in this regard, although much still has to be done. Discharge fees on pollutants were first imposed in one form or another and with varying degrees of coverage beginning in the late 1970s - basically at the same time as China's economic reform began. They have been widened in coverage and strengthened since then. Pollutants of water and air, solid wastes and noise creation incur discharge fees. However, discharge fees on sulphur dioxide and sewage have only been levied since 1992 in nine cities in two provinces on a trial basis.

In 1994, pollution discharge fees (including fines and related items) amounted to 3.097 billion yuan. Of this 2.355 billion yuan was obtained from regular pollution charges and 0.742 billion yuan from fines, penalties and related items (Mao, 1996, p. 1). Charges on emissions of water pollutants other than sewage were the major source of revenue, followed by charges on emissions of air pollutants, those on solid wastes, noise, and sewage.

Nearly all the revenue obtained from pollution charges was spent on treatment of pollutants and on administration. In 1994, 2.49 billion yuan was spent on the treatment of pollution and 0.54 billion yuan on government administration of pollution regulations. None of the income collected was used to compensate victims of pollution for damages caused. Nevertheless, in some cases victims can claim damages from polluters and this even when they are not fully compensated for its damage by the polluter, the payment is often sufficient to moderate the behaviour of the polluter. Take the example

of a non-ferrous smelter which was once a serious source of cadmium poisoning. This plant located in Daye County emitted large quantities of cadmium into the air resulting in cadmium poisoning among nearby villagers. In the later part of the 1980s, it was required to compensate victims for their medical expenses. This was sufficient to cause the enterprise to install technology which reduced contamination of the air by cadmium. This extra investment in technology showed a substantial positive rate of social return (Zhiyong et al., 1991).

In relation to compensation of victims for environmental damage, there is still scope for strengthening China's laws and their application. There is still some doubts about whether China's discharge fees are fairly determined and consistently applied to individual enterprise in practice.

The National Environmental Protection Agency is intending to increase the level of pollution emission fees and to apply fees to emissions at all levels rather than to those exceeding some threshold quantity as is the case for a number of pollutants at present. Some of these extra funds will be used to provide loans to enterprises for environmental protection and for treatment of pollutants.

Overall China's performance in relation to protection of natural resources and environmental protection is mixed. Even in relation to pollution control, it seems that at least up to now less attention has been given to pollution prevention than to pollution treatment. So principles and practice still have yet to be brought fully into line. Furthermore it has proven difficult at the village and township level to enforce environmental regulations but it is at this level that growth in industrial production has been especially rapid. Greater attention will need to be given to control of pollution from village enterprises in the

future, and this is likely to require greater devolution of control of pollution to regional bodies, but with some central surveillance being necessary to set guidelines and monitor compliance. Ideally its approach to regulation should be an interactive side-by-side one rather than top-down (Tisdell, 1996).

8. CONCLUDING COMMENTS

Transition of economies raises major policy challenges as far as the regulation of the use of natural resources and the environment are concerned. These are not free goods and need to be appropriately priced or valued. This was neglected for too long by the former CPEs. Policy makers in the European CPEs only officially recognised environmental problems and began reacting to them in the years leading up to transition. It was not until the late 1980s and 1990 that a holistic approach to regulating the use of natural resources and the environment was adopted. While on the surface the new approach seemed valuable, it did not provide an effective means for controlling the level of pollution emissions but their level was a source of funds for treating emitted waste. More attention is needed now for providing economic incentives for reductions in levels of pollution. However, it is necessary to adopt a long-run point of view in relation to such regulations. Scope for altering such emissions in the short run may be relatively limited, given the nature of existing equipment and infrastructure. Greater scope exists for modification as new investment proceeds. This is not to say that no scope for modification exists in the short to medium-term, just that one must be realistic about what is economically possible.

Former European CPEs appear to have tried to enforce their environmental controls throughout the whole of their territory by establishment of regional and national environmental

funds to support environmental agencies. China appears to have taken a more cautious approach. In the first instance, it has restricted the main enforcement of its environmental regulations to a limited number of cities or regions, extending the number of regions under control, as experience with environmental regulations is obtained and China's authorities are convinced of the value of the regulations. This is the "crossing the river by touching-stones method". To date the main emphasis of China has not been on pollution prevention, but the situation is changing, and it will change further as its socio-economic system evolves. Such an approach is likely to cause less social disruption than a "big-bang" approach and may in the end be more successful. And it ought to be kept in mind that market economies are still searching for the best ways to deal with their environmental problems. They do not have an off-the-shelf answer since environmental regulation has only become a major focus of their policy in recent decades, and is still subject to controversy. However, there is widespread agreement that natural resources and the environment are not free goods, and they must be valued or prices appropriately.

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